© 2015 IJSRSET | Volume 1 | Issue 6 | Print ISSN: 2395-1990 | Online ISSN : 2394-4099
Themed Section : Engineering and Technology

Modeling and Simulation of Novel Isolated AC–DC Converter for Wind Farms using LLC Resonant Converter for Industrial Application in MATLAB

Prasanna Lakshmi Bukke
Siddartha Institute of Engineering and Technology(SIET), Hyderabad , Telangana, India

ABSTRACT

In this paper wind turbine fed high efficiency ac to dc converter is proposed for industrial application(R, RL loads). A SIMULINK model is proposed with wind turbine and with a constant ac voltage source. An LLC resonant converter is also used in this circuit configuration to achieve the higher efficiency. Total circuit is implemented and simulated in MATLAB 2012a software.

Keywords: LLC resonant converter, wind generation

I. INTRODUCTION

In this project I am using The High-Efficiency Isolated AC–DC Converter Using the Three-Phase Interleaved LLC Resonant Converter Employing the Y-Connected Rectifier as a reference and the total project Is developed by using MATLAB 2012a software for developing the circuit configuration,

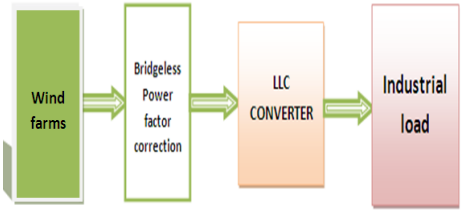


Figure 1. Block diagram

Here in this circuit the total components are arranged and simulated in graphical user interfacing (GUI) environment. Here in this project we are getting input from wind forms and that is implemented using the elements in SIMULINK library and the output of that wind forms are connected to Bridgeless Power factor correction unit and that is also implemented using the elements and switches in SIMSCAPE library and that is again connected to LLC converter that is implemented using MATLAB library and finally we are connecting Industrial load and total simulation model is simulated using RUN option, so finally the outputs are observed by using the scope block in MATLAB library.

Basically in order to implement the ac to dc circuit, we need to have a model sheet in matlab 2012a software in that model sheet we need to arrange the ac voltage source and four contol switches and their corresponding pulse genarater resistence branch and scope measurement blocks as shown in the figure

Power converters

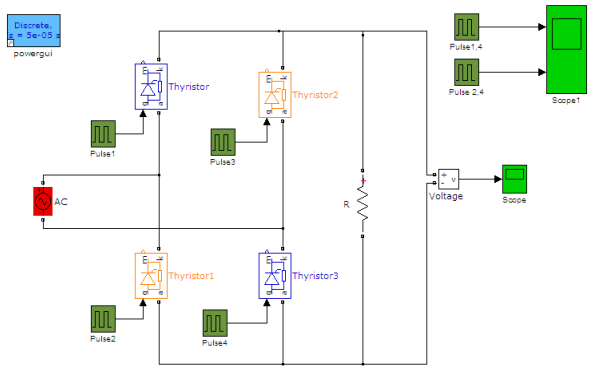
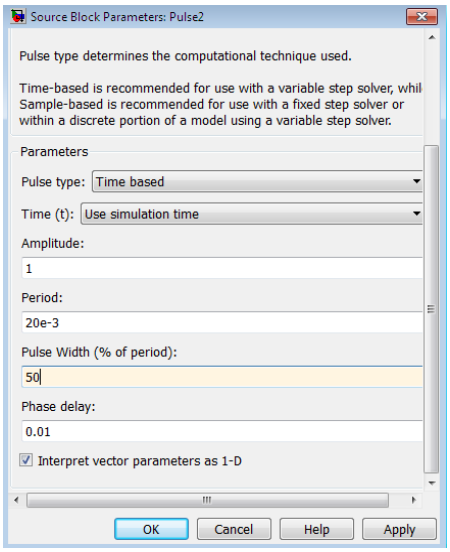


Figure 2. Modeling of Ac To Dc Converter

Pulse genarators are the blocks used to genarate the pulse signals to either ON or OFF the control switches. The below parameters are reuired to genarate the pulse.



So beacause of the above parameters the below two pulse signal are produced so that these signal are used to turn off and turn on the switches that are present in the ac to dc converter.

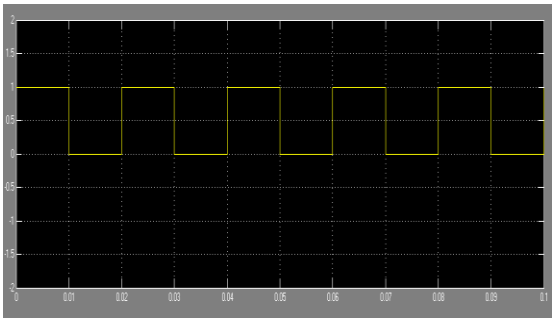


Figure 3. Gate Signal For 1,2 Switches

So figure 4 represents the pulse signals that is used to turn on and off the 1,2 switches and fig 5 represents the pulse signals that is used to turn on and off the 3,4 switches

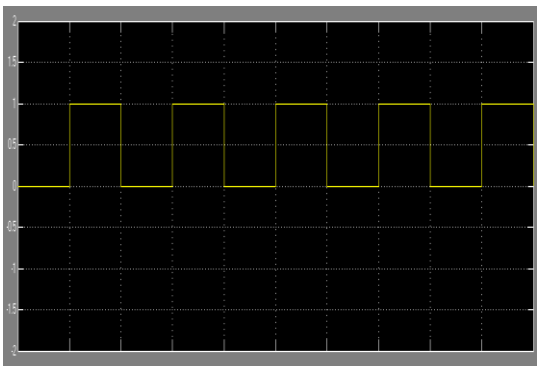


Figure 4. Gate Signal For 3.4 Switches

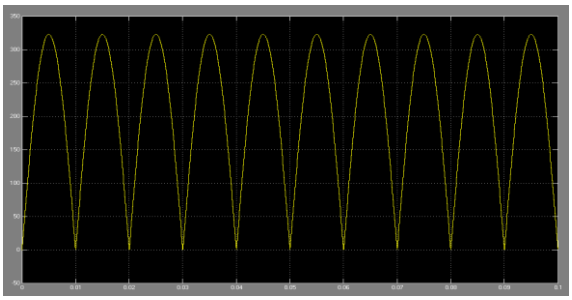


Figure 5. Output For Ac Top Dc Converter

The above figure represents the total output voltage of ac to dc converter that obtaiend across the R load .

II. DC TO AC CONVERTER MODELLING

The matlab circute for dc to ac converter is shown below the requied elements are collected from the simscape library in matlab library window.

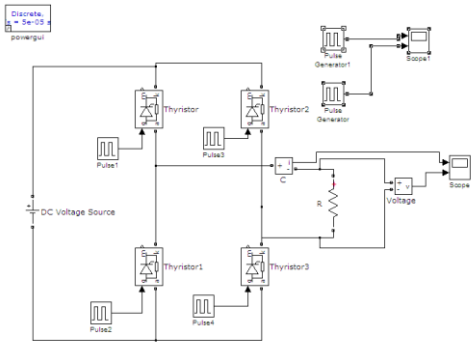
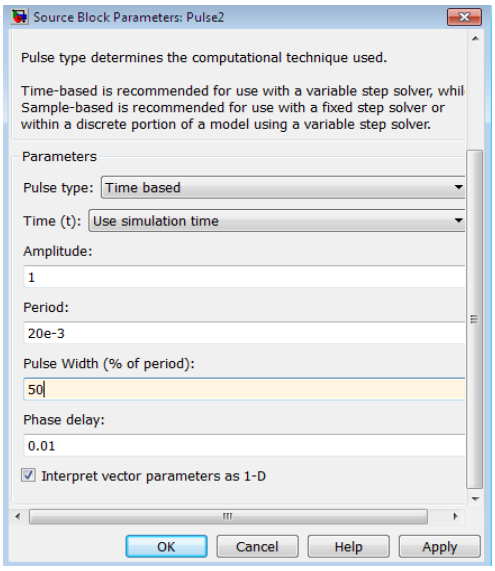


Figure 6. Model Of Dc To Ac Converter

The above model is consisted of pwm genarator for genatating the pulse for dc to ac converter



Thease are the parameter that are requied to genarate the pulse signal that are useful to oprate the 2 arms 4 pulse signals

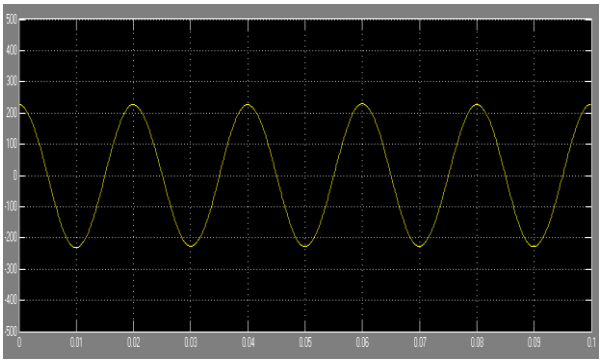


Figure 7. Altenating Current At Output

The above figure shows the output current of the dc to ac converter at the R load.

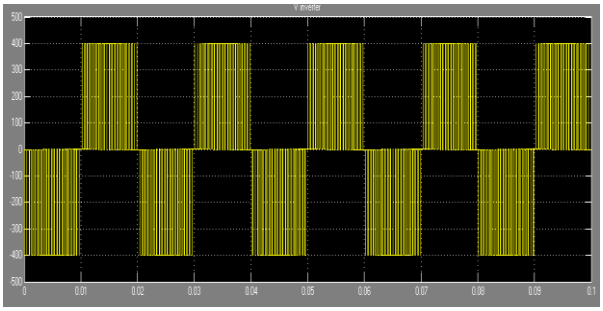


Figure 8. Ac voltage at output with out filter

The above figure represents the pulsating ac output voltage of dc to ac converter withany filter, so if want change the pulsating ac in to sinasoidal ac voltage waveform we need filter.

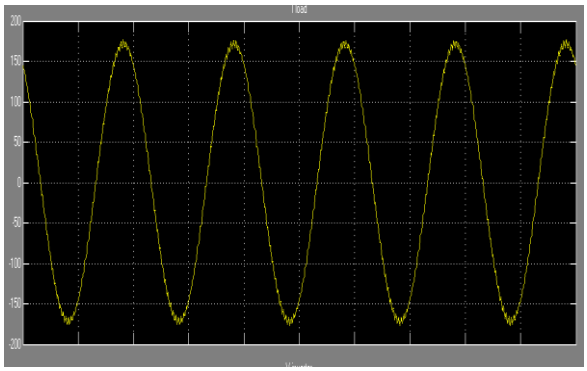


Figure 9. Ac Voltage At Output With Filter

The ac voltage acroos the load with filter is shown in the figure after inserting the filter we will achive the sinasoidal voltage

A three level ac to dc converter consisted of These two converters are used in our circute configuration that is shown in figure.

III. SIMULATION RESULTS

The below figure 9 represents the total matlab model of three level ac to dc converter with a constant ac voltage source and total circuit is operated with the controlling circuit proposed in the below sections.that shows the importence of pulse genarator and the controlling pulses are genarated by the use of the these pulse genarator.

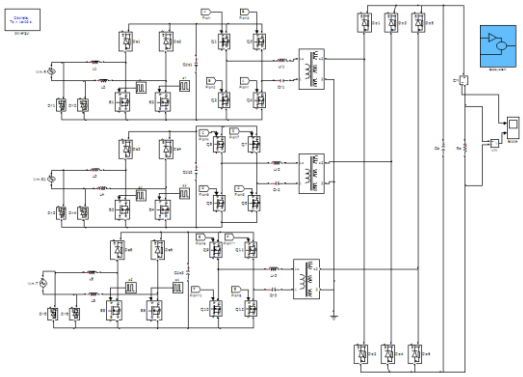
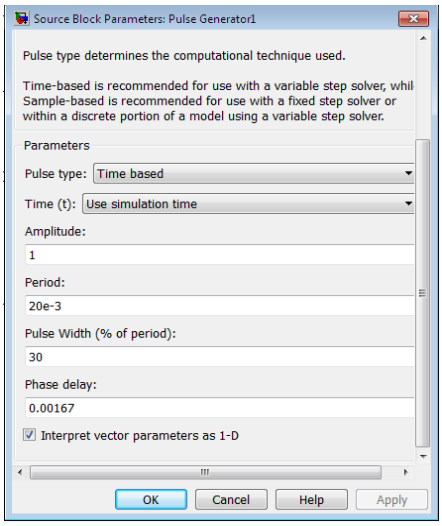


Figure 9. MATLAB file

In pulse genarater genarator block is can able to genarate the pulse with different amplitudes and widths and different time period.



So every pulse generator is can change the total output. so that it is very important element in this controlling circuit.

Controlling circuit for the three level ac to dc converter with a constant ac voltage source is shown below

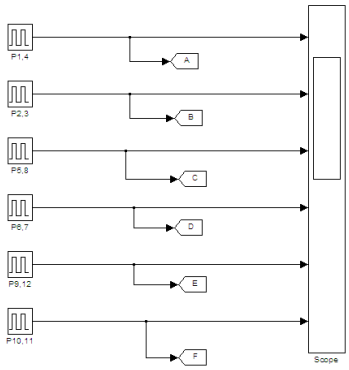


Figure 10. Controlling circuit

Controlling pulses for the three level ac to dc converter with a constant ac voltage source is shown below

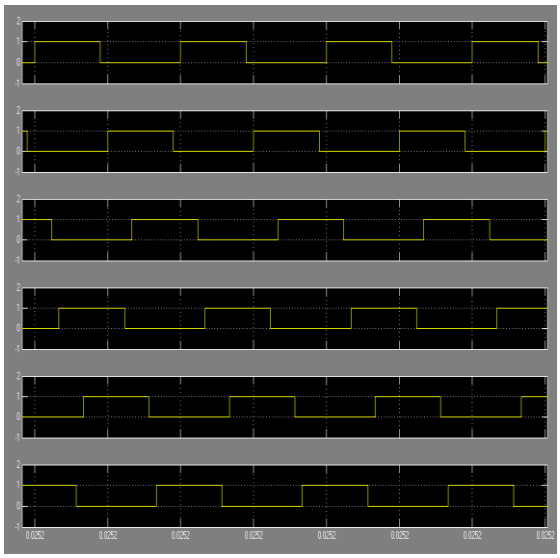


Figure 11. Controlling pulses

Output voltage for the three level ac to dc converter with a constant ac voltage source is shown below

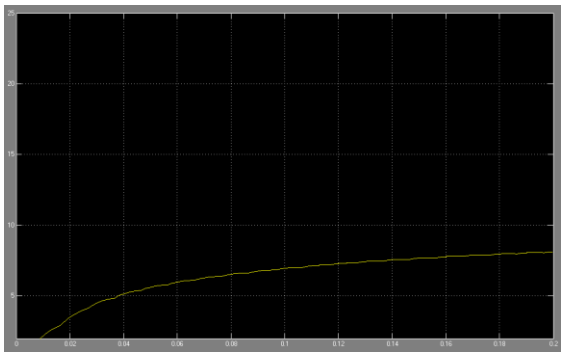


Figure 12. Output voltage

Output current for the three level ac to dc converter with a constant ac voltage source is shown below

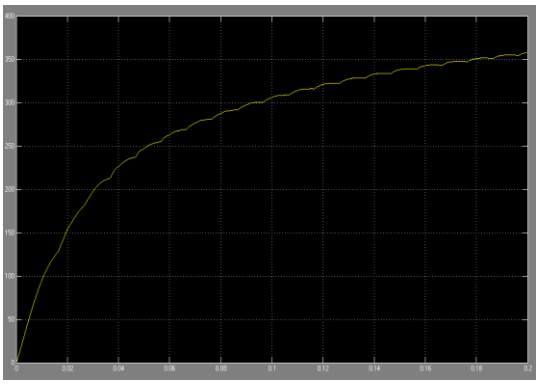


Figure 13. Output current

The below figure represents the total matlab model of three level ac to dc onverter with the trditional wind turbines

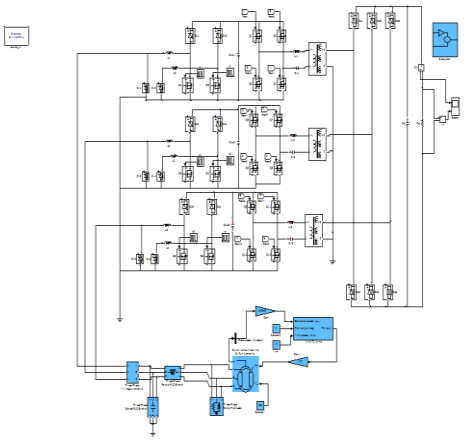


Figure 14. Wind fed ac dc converter model

Controlling circuit for the three level ac to dc converter with with the trditional wind turbines is shown below

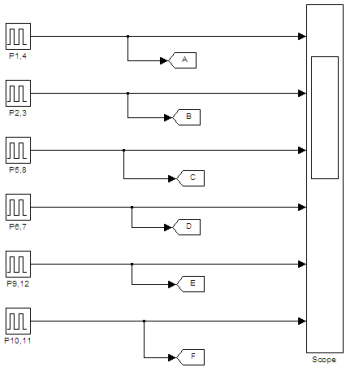


Figure 15. Controlling Circuit

The below figure Controlling pulses for the three level ac to dc converter with the trditional wind turbines is shown below

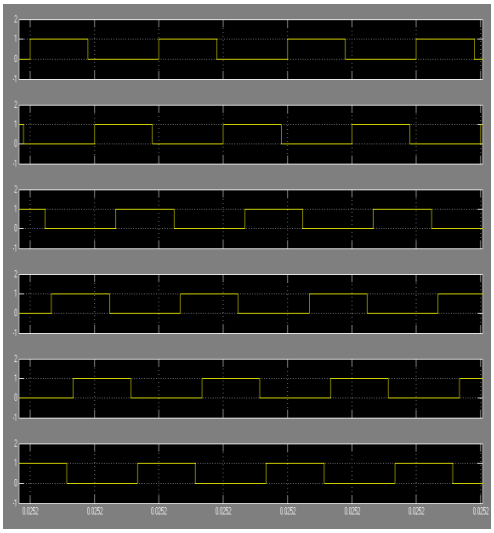


Figure 16. Controlling Pulse

The below figure represents Output voltage for the three level ac to dc converter with the trditional wind turbines is shown below

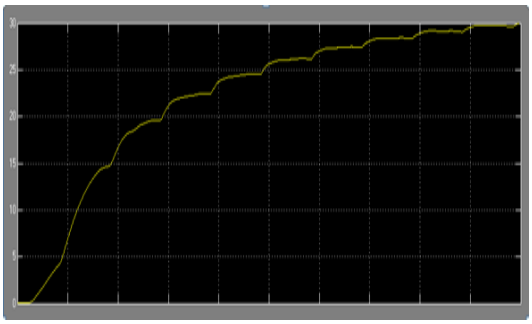


Figure 17. output voltage

The below figure represents Output current for the three level ac to dc converter with the trditional wind turbines is shown below

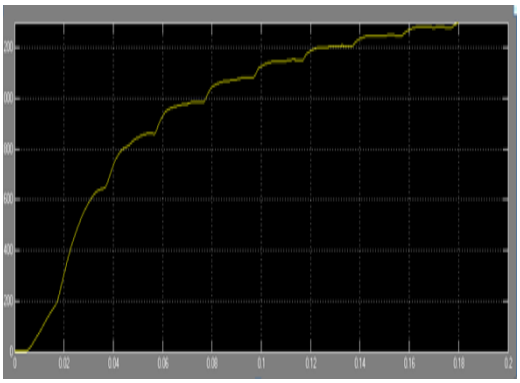


Figure 18. output current

IV. CONCLUSION

In this "A Novel High-efficiency isolated Ac–Dc converter For wind farms using LLC resonant Converter for industrial application" paper proposed converter for industrial application(R, RL loads) is simulated by using the MATLAB software. SIMULINK models are proposed and simulated successfully with wind turbine and with a constant ac voltage source. An LLC resonant converter is also used in this circuit configuration to achieve the higher efficiency. Total circuit is implemented and simulated in MATLAB 2012a software.

V. REFERENCES

[1]. A. Pratt, P. Kumar, and T. V. Aldridge, "Evaluation of 400v dc distribution in telco and data centers to improve energy efficiency," in Proc. Int. Telecommun. Energy Conf., 2007, pp. 32–39.

[2]. H. Kakigano, Y. Miura, and T. Ise, "Low-voltage bipolar-type DC microgrid for super high quality distribution," IEEE Trans. Power Electron., vol. 25, no. 12, pp. 3066–3075, Dec. 2010.

[3]. T.-F. Wu, Y.-C. Chen, J.-G. Yang, and C.-L. Kuo, "Isolated bidirectional full-bridge DC–DC converter with a flyback snubber," IEEE Trans. Power Electron., vol. 25, no. 7, pp. 1915–1922, Jul. 2010.

[4]. G. Byeon, T. Yoon, S. Oh, and G. Jang, "Energy management strategy of the DC distribution system in buildings using the EV service model," IEEE Trans. Power Electron., vol. 28, no. 4, pp. 1544–1554, Apr. 2013.